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BULLETIN
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A preliminary Revision of the North American Isoeteciaceae.

By A. J. GROUT.

During the past winter a critical study of this family of mosses has been made at the Herbarium of Columbia University. Wishing to obtain more material illustrating the distribution of the species, a brief summary is here presented, giving the distribution, so far as can be determined, from material at hand. Persons having specimens from outside the range here indicated will confer a great favor by sending them to me at the Herbarium of Columbia University. If duplicates can also be sent, a suitable return will be made for them. I am already greatly indebted to several persons for aid in my work, for which acknowledgments will be made in the final publication.

ISOETECIACEAE Spruce, Ann. and Mag. Nat. Hist. (II.) 3:
285. 1849.

Gametophyte generally large, never minute. Primary stems creeping, radiculose. Paraphyllia lacking (except in *Climacium*). Leaves smooth, often plicate or concave; median leaf-cells linear, alar cells quadrate (except in *Holmgrenia*).

Sporophyte. Seta smooth, twisted. Calyptra cucullate. Operculum conic to conic-rostrate. Columella persistent. Capsule erect, straight, not conspicuously contracted under the mouth when dry. Peristome double, well developed; teeth lanceolate, articulate. Segments of endostome linear to lanceolate, attached

to a narrow basal membrane, free, or adherent to the teeth in two species of *Pylaisiella*; cilia rudimentary or wanting. Spores roughened.

Distinguished from the Brachytheciaceae by the straight erect capsule, absence of cilia, short basal membrane, capsule not contracted under the mouth when dry.

Homalothecium and certain species of *Brachythecium* (notably *B. acuminatum*) have the capsule characters of this family, but their other characters show their relationship to be with the Brachytheciaceae.

Key to the Genera.

Leaves veined, vein single, extending to the middle of the leaf or beyond.

4. CLIMACIUM.

Leaves veinless or the veins short and double.

Alar cells not quadrate.

3. HOLMGRENIA (*Orthothecium*).

Alar cells quadrate.

Complanate foliate (except *E. repens* and *E. seductrix*) with very large persistent annulus (except *E. Drummondii*).

1. ENTODON (*Cylindrothecium*).

Leaves more or less falcate-secund especially at the tips of branches; annulus narrow.

2. PYLAISIELLA (*Pylaisia*).

1. ENTODON. C. Muell. Linnaea, 18: 704. 1844. Also Bot. Zeit. 1894: 740.

[CYLINDROTHECIUM Br. & Sch. Bry. Eur. fasc. 46 and 47. pl. 464, 465. 1851.]

Leaves obtuse, quadrate; alar cells of 2 or 3 layers.

7. *E. orthocarpus*.

Leaves acute or acuminate, quadrate, alar cells of one layer.

Leaves gradually narrowly acuminate; segments of endostome adhering to the teeth.

8. *E. brevisetus*.

Leaves acute to apiculate; segments free.

Teeth conspicuously hyaline margined.

6. *E. repens*.

Teeth not conspicuously hyaline margined.

Annulus apparently none; seta yellow.

5. *E. Drummondii*.

Annulus of narrow small cells; seta red.

2. *E. seductrix*.

Annulus large, of large cells.

Teeth uniformly papillose-roughened.

3. *E. compressus*.

Teeth conspicuously striolate above; leaves serrate.

4. *E. Sullivantii*.

Teeth not conspicuously striolate; leaves nearly entire.

1. *E. cladorrhizans*.

1. ENTODON CLADORRHIZANS (Hedw.) C. Muell. *Linnaea*, 18: 707. 1844.

Cylindrothecium cladorrhizans Schimp. Syn. Ed. 1: 514. 1860.

Entodon Transylvanicus Demet. Hedwigia, 23: 81. 1884.

Entodon minutipes Kindb. Can. Rec. Sci. 1894: 21. 1894.

Not uncommon in North America east of the Mississippi; Minnesota (Holzinger), Iowa (A. S. Hitchcock and Miss McGee).

Limpricht, in Rab. Krypt. Fl. 4: part 3: 30, separates *E. Schleicheri* of Europe from *E. cladorrhizans* and also cites *E. cladorrhizans* as European. That the two species are distinct can hardly be doubted, if the peristomal teeth be compared. *E. acicularis* C. Muell. and Kindb. in Macoun, Cat. Can. Pl. part 6, 176, [Macoun's 816 (in part) and 170,] is only a peculiar form of *E. cladorrhizans*. It may possibly prove to be a good variety. It is characterized by having a peculiar brownish green color, the tips of branches lighter; very short turgid branches which are largest in the middle and at the largest part bear leaves as large as the stem leaves; capsule and seta much shorter and teeth more perforate than is typical. *E. Transylvanicus* Demeter and *E. minutipes* Kindb. are said by Limpricht, l. c. to be identical, and only slightly divergent forms of *E. cladorrhizans*. I have been unable to see specimens of either.

2. ENTODON SEDUCTRIX (Hedw.) C. Muell. *Linnaea*, 19: 214. 1847.

Neckera seductrix Hedw. Spec. Musc. 208. pl. 47. f. 8-13. 1801.

Pterigynandrum Carolinianum Brid. Musc. Recent. Suppl. 1: 132. 1803.

Cylindrothecium seductrix Sull. in A. Gray, Man. Ed. 2: 664. 1856.

A very variable species and appropriately named, found only in the eastern United States. Common in the Appalachian region from Canada to the Gulf; less frequent northward and not reported far west of the Mississippi. I have seen no specimens from northern New England or eastern Canada.

Dallas, Texas, (J. Ball), Missouri, Kansas, Wisconsin, Minnesota, Ontario.

2a. *E. SEDUCTRIX LANCEOLATUS* n. var.

Stem leaves ovate-lanceolate, acute; branch leaves broadly lanceolate, tapering gradually to the serrate acute apex. On rotten wood, Hanging Rock, Wabash Co., Ill., April 3, 1890. (J. Schneck.)

2b. *E. SEDUCTRIX MINUS* Aust. Mss. in herb.

Entire plant much reduced, dirty green; leaves, seta and capsule shorter than in type. Capsule 1.5–2 mm. long, its length about 3 times its diameter.

Ohio, Sullivant. Sand hill near Augusta, Ga., J. D. Smith, Feb. 2, 1877. A portion of no. 388 of Sull. and Lesq. Musc. Bor. Am., in Columbia Herb., issued as *Cylindrothecium compressum* Br. and Sch. is this variety.

2c. *E. SEDUCTRIX DEMETRII* (Ren. & Card.).

Entodon Demetrii Ren. & Card. Rev. Bry. 20: 14. 1893.

Stems irregularly divided and branched, strongly complanate-foliate, slender, having almost exactly the facies of *E. compressus*; leaves ovate, gradually acute, very entire. Peristomal teeth often irregularly perforate.

On stones at top of well, Emma, Saline Co., Mo., Rev. C. H. Demetrio.

3. *ENTODON COMPRESSUS* (Hedw.) C. Muell. Linnaea, 18: 707. 1844.

Leskea compressa Hedw. Spec. Musc. 232. pl. 56. f. 1–7. 1801.

- Cylindrothecium compressum* Br. & Sch. Bry. Eur. fasc. 46 and 47. 1851.

Rhode Island, New Jersey, Ohio, Illinois, Kansas, Nebraska, Missouri. Rare.

4. *ENTODON SULLIVANTII* C. Muell. Can. Rec. Sci. 1894: 21. 1894.

Neckera Sullivantii C. Muell. Syn. Musc. 2: 65. 1851.

- Cylindrothecium Sullivantii* Sull. in A. Gray, Man. Ed. 2: 664. 1856.

North Carolina (Gray and Sullivant), Tennessee (Lesquereux), South Carolina. Very rare.

5. ENTODON DRUMMONDII (Br. & Sch.) Jaeger & Sauerb. Ber. St. Gall. Nat. Gesell. 1876-77: 282.

Cylindrothecium Drummondii Br. & Sch. Bry. Eur. fasc. 46 and 47. 1851.

Southern U. S., east of the Mississippi, north to Tennessee and North Carolina. Northern Mexico (Pringle).

6. ENTODON REPENS (Brid.).

Pterigynandrum repens Brid. Musc. Recent. Suppl. 1: 131. 1806.

Platygyrium repens Br. & Sch. Bry. Eur. fasc. 46 and 47. *pl.* 458. 1851.

Cylindrothecium repens De Not. Epil. 214. 1869.

North America, east of the Rocky Mountains. Common.

6a. ENTODON REPENS ORTHACLADOS (Kindb.).

Platygyrium repens orthoclados Kindb. in Macoun, Cat. Can. Pl. 6: 172. 1892.

Platygyrium repens sciuroides Limpr. Rab. Krypt. Fl. 4: part 3, 7. 1896.

Platygyrium repens ramulis elongatis Bry. Eur. *pl.* 458. *f.* 3.

Branches much larger and longer than in the species, leaves larger, loosely imbricate, shortly bicostate.

Ontario, Macoun Canadian Mosses, no. 259.

7. ENTODON ORTHOCARPUS (La Pyl.) Lindb. Musc. Scand. 39. 1829.

Hypnum Schreberi orthocarpum Brid. Bry. Univ. 2: 422. 1827.

Hypnum orthocarpum La Pylaie; Brid. Bry. Univ. 2: 422. 1827.

Cylindrothecium concinnum Schimp. Syn. 515. 1860.

Colorado, Brandegee. Although collected but once and in a sterile state, Brandegee's specimens are undoubtedly this species.

8. ENTODON BREVISETUS (Hook. & Wils.) Jaeger & Sauerb. Ber. St. Gall. Nat. Gesell. 1876-77: 291.

Neckera breviseta Hook. & Wils. Lond. Jour. Bot. 4: 419. *pl.* 24. *f. a.* 1842.

Cylindrothecium brevisetum Br. & Sch. Bry. Eur. fasc. 46-47. 1851.

New Jersey, Virginia, Pennsylvania, Ohio, Missouri, Canaan Forks, New Brunswick (J. Moser). Rare.

ENTODON MACOUNII C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 6: 177. 1892.

Authentic specimens from type locality in Herb. Macoun are not referable to *Entodon* at all, but are one of the complanate-foliate Hypneae. Capsules are needed to classify them. There are no quadrate alar cells and the cells at the angles are so little enlarged as to be scarcely noticeable.

ENTODON (?) EXPALLENS C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 6: 177. 1892.

This species belongs to the same group as *E. Macounii*.

ENTODON SUBFLACEUS C. Muell. & Kindb. Can. Rec. Sci. 1894: 21.

I have been unable to examine any specimens of this species, as Prof. Macoun has none in his herbarium.

CYLINDROTHECIUM FLORIDANUM Duby, Regensb. Flora, 58: 284, is probably not related to *Entodon*, as the horizontal capsules described are not in accordance with the characters of the genus. We have not been able to obtain a specimen of it, as the type cannot be found in the Duby nor the Boissier herbaria at Geneva.

2. PYLAISIELLA Kindb. Can. Rec. Sci. 1894: 21.

[PYLAISIA Br. & Sch. Bry. Eur. fasc. 46-47. 1851. Not Desv. 1814.]

The generic name *Pylaisia* was first used by Desvaux in 1814 to designate a new genus named in honor of De La Pylaie. The specimen upon which his genus was founded is stated to be nothing more than a depauperate form of *Hypnum denticulatum* L.

In 1851 Bruch and Schimper took up the name for a new genus founded on *Hypnum polyanthos* Schreb, thus publishing a homonym.

DeNotaris in 1869 extended the genus *Pylaisia* by including *Orthothecium* of the Bryol. Eur., and in this extended form it was degraded by Lindberg in 1879 to a sub-genus of *Stereodon* of Mitten. The name *Pylaisiella* proposed by Kindberg for two species

of the genus, viz.: *P. velutina* and *P. subdenticulata*, is very appropriate, as it will preserve the name of De La Pylaie.

Segments of the endostome entirely free from the teeth.

Operculum conic; cilia present, rudimentary.

1. *P. polyantha*.

Operculum short, rostrate; cilia lacking.

2. *P. subdenticulata*.

Segments partially or wholly adherent to the teeth:

Partially adherent; spores 18–24 μ .

3. *P. intricata*.

Wholly adherent; spores 25–30 μ .

4. *P. velutina*.

1. PYLAISIELLA POLYANTHA (Schreb.).

Hypnum polyanthos Schreb. Spicil. Flor. Lips. 97. 1771.

Pylaisia polyantha Br. & Sch. Bry. Eur. fasc. 46 and 47. pl. 455. 1851.

Stereodon polyanthos Mitt. Journ. Linn. Soc. 8: 40. 1865.

Pylaisia heteromalla Br. & Sch. Lond. Jour. Bot. 2: 669. 1843.

Hypnum polyanthum pallidifolium C. Muell. Syn. 2: 337. 1851.

Pylaisia Ontariense C. Muell. & Kindb. in Macoun, Cat. Can. Pl. 6: 174. 1892.

Canada and northwestern United States (Macoun); Kakabeka Falls, Ont. (Mrs. Britton); Saskatchewan and Rocky Mountains (Bourgeau); Santa Fé (Fendler); White Mountains (James); Montana (R. S. Williams); Pike's Peak, Colo. (S. L. Clarke); Minnesota (F. F. Wood). Apparently widely distributed in Canada and along the northern border of the United States in mountainous regions, but rather infrequent and local.

The typical American form of this species is quite variable in leaf characters, even on the same plant, but it differs constantly from European specimens in that the leaves are shorter, more abruptly acuminate and more broadly ovate-lanceolate. The length of the leaf of the European form averages 1.5 mm.; that of the American 1 mm., though I have found one plant whose leaves measured 1.4 mm. The length of the acumination of the perichaetial leaves is also very variable. It may be that our forms of this and the next species are but two varieties of the European *P. polyantha*. The American *polyantha* answers very closely to the description of *P. polyantha brevifolia* Lindb. & Arucl, Musc. Asiae-bor. 152. 1890. I have seen the type specimens of *P. heteromalla* from Schimper's herbarium and not only are they *P. polyantha*, but

Schimper himself indicated clearly on his labels that he did not consider it a good species; Drummond's no. 222, on which this species was founded, is evidently somewhat mixed, as the Columbia Herbarium specimen is *P. intricata*.

1a. PYLAISIELLA POLYANTHA JAMESII (Sull.) E. G. Britton.

Pylaisia Jamesii Sull. & Lesq. Musc. Bor. Am. Ed. 2. 383. 1865.

Pylaisia subdenticulata obscura Lesq. & James, Mosses N. A. 309. 1884.

Gametophyte smaller than the type; leaves shorter, broadly ovate-lanceolate, shortly bicostate; length of leaf-cells 4-6 times their diameter; quadrate alar cells numerous; perichaetial leaves shorter, abruptly acuminate.

Sporophyte with shorter subulate-lanceolate peristomal teeth, which are also shorter than the segments.

On the ground and roots of trees. Chelsea, Mass. (James.)

This variety has the appearance of *P. subdenticulata* because of its reduced size, otherwise it has the characters of American *polyantha*, such as conic operculum and rudimentary cilia.

1b. PYLAISIELLA POLYANTHA PSEUDO-PLATYGYRIA (Kindb.).

Pylaisia pseudo-platygyrium Kindb.; Macoun, Cat. Can. Pl. 6: 173. 1892.

Pylaisia filari-acuminata Kindb. l. c. 174.

Leaves narrowly long-acuminate; upper branch leaves distantly serrate-dentate along sides of acumination; inner perichaetial leaves often long-acuminate, serrate-dentate along the acumination; cilia 1 or 2, better developed than in the type.

Type locality, shores of Lake Nipigon, Ontario. Also found on the west side of the Columbia River, at Revelstoke, B. C.

On decayed trunks and on "logs subject to inundation."

Exsiccata: Macoun, Can. Musc. 626. (*Pylaisia filari-acuminata*.)

2. PYLAISIELLA SUBDENTICULATA (Schimp.) Kindb. Can. Rec. Sci. 1894: 22.

Pylaisia subdenticulata Schimp. Bry. Eur. fasc. 46 and 47. 1851.

Pylaisia denticulata Sull. in A. Gray, Man. Ed. 2, 62. 1856. New York and New Jersey (Austin); Maryland (Holzinger); Ohio (H. J. Biddlecome); Athens, Ill. (Hall). Very close to *P.*

polyantha, but distinguished by the reduced size, rostrate operculum and absence of cilia.

3. PYLAISIELLA INTRICATA (Hedw.).

Pterigynandrum intricatum Hedw. Spec. Musc. 85. *pl.* 18. 1801.

Pylaisia intricata Schimp. Bry. Eur. fasc. 46 and 47. 1851.

Hypnum intricatum C. Muell. Syn. 2: 338. 1851.

Stereodan intricatus Lindb. Musc. Asiae-bor. 2: 151. 1890.

Pylaisia Selwynii Kindb. Ott. Nat. 2: 156. 1889.

Common in the northeastern United States and eastern Canada, Kansas, Missouri, Mississippi, Georgia (Ravenal), Florida (Chapman).

This species is easily distinguished by its curved branches, numerous quadrate alar cells and partially adherent segments. It varies a great deal in length of leaves and in length of leaf-cells, length and color of capsule and size of spores. Authentic specimens of *Pylaisia Selwynii* Kindb. show that it is merely a form of this species growing in exposed dry places. The plants are darker and the leaves more strongly recurved than usual.

4. PYLAISIELLA VELUTINA (Schimp.) Kindb. Can. Rec. Sci. 1894: 21.

Pylaisia velutina Schimp. Bry. Eur. fasc. 46 and 47. 1851.

New Brunswick, and Mt. Desert, Maine, south to North Carolina, west to Ohio and Indiana.

Distinguished from *P. intricata* by the entirely adherent segments, narrower leaves with fewer quadrate alar cells, and larger spores.

Pylaisia revolutifolia Kindb. in Herb. Macoun, from Leamington, Ont., August 4, 1892, and Pelee Point, Ont., is *Entodon repens*.

3. HOLMGRENIA Lindb. Öfv. Vet.-Ak. Förh. 1862: 605. 1863.

[ORTHOTHECIUM Br. & Sch. Bry. Eur. fasc. 48. 1851. Not Schott. & Endl. Melet. Bot. 31. 1832.]

Gametophyte large (5–10 cm. high); leaves strongly plicate
Gametophyte small (2 cm. high); leaves not plicate.

1. *H. chrysea*.
2. *H. stricta*.

1. HOLMGRENIA CHRYSSEA (Schwaegr.) Lindb. Öfv. Vet.-Ak. Förh.
1862: 605. 1863.

Hypnum chryseum Schwaegr. Schulte's Reise auf d. Glockner,
2: 364. 1804.

Orthothecium chryseum Br. & Sch. Bry. Eur. fasc. 48. *pl.* 461.
1851.

Very rare. Rocky Mountains (Macoun, Drummond); Sas-
katchewan (E. Bourgeau).

2. HOLMGRENIA STRICTA Lorentz, Moos Stud. 122. *pl.* 5. 1864.

Stereodon rubellus Mitt. Journ. Linn. Soc. 8: 40. 1865.

Orthothecium rubellum Kindb. Laubm. Schwed. u. Norw. 46.
1883.

Orthothecium intricatum var. *rubellum* Husnot, Musc. Gall. 173.
1893.

Davis Strait (Taylor). In several sets of Drummond's mosses
no. 73, from the Rocky Mountains (distributed as *Catoscopium*
nigratum), there is no trace of this species. Dr. Mitten kindly
sent a portion of the Davis Strait plant and indicates that *Holm-*
grenia rufescens (Dicks.) Lindb. has not yet been found in North
America. In a letter dated April 21, 1896, he says: "I have
looked through all my specimens of *Orthothecium rufescens* and
find no trace of any North American examples. All Taylor sent
me are in with *O. chryseum*, as are the 221 of Drummond in both
my sets. I suppose I must have mistaken one of Taylor's to be
the first named."

4. CLIMACIUM Web. & Mohr, Iter Suec. 96. 1804.

Capsules 3-4 times and median leaf-cells 10 times as long as broad.

1. *C. dendroides*.

Capsules 5-6 times and median leaf-cells 2-7 times as long as broad.

2. *C. Americanum*.

1. CLIMACIUM DENDROIDES Web. & Mohr, Iter Suec. 96. 1804.

The northern and western species. New Brunswick to St.
Paul Island, Behring sea, south to New Jersey, Colorado and Cali-
fornia. Not represented from Pennsylvania or the North Central
States.

- 1a. CLIMACIUM DENDROIDES OREGONENSE Ren. & Card. Bot. Gaz.
15: 59. 1890.

Type from Oregon, Willamette R. (L. F. Henderson). A specimen from Sauvie's Island, Oregon (C. G. Pringle no. 510), is probably referable to this variety, as the leaves are almost entire, although broader instead of narrower than in the type.

2. CLIMACIUM AMERICANUM Brid. Musc. Suppl. part 2, 45. 1812.

The southern and eastern species, ranging from Canada to North Carolina and probably south to the Gulf; west to Minnesota, Iowa, Illinois and Missouri.

- 2a. CLIMACIUM AMERICANUM KINDBERGII Ren. & Card. Bot. Gaz.
15: 1890.

C. Americanum fluitans Aust. Musc. App. 49. no. 289. Name only. 1870.

Varying greatly in appearance. Leaves characterized by oblong-hexagonal areolation and lack of auricles. The dendroid form, which is found especially in southern swamps, has often been mistaken for *C. dendroides*. Has the range of the type and extends to the Gulf. The Columbia Herbarium specimens of Sull. & Lesq. Musc. Bor. Am. Ed. 2, no. 42, and Drummond's Musc. Am. (Southern States), 120, are this variety.

CLIMACIUM RUTHENICUM. Lindb. is not a *Climacium*. Its affinities are uncertain, but is not one of the Isotheciaceae.

- HOMALOTHECIUM Br. & Sch. Bry. Eur. fasc. 46 and 47. 1851.

This genus is so closely allied to *Camptothecium* that it is clearly a violation of natural relationships to put it in another family. The nearly erect and symmetric capsule and the incomplete peristome are the only characters associating *Homalothecium* with the Isotheciaceae.

- ISOOTHECIUM Brid. Bryol. Univ. 2: 355. pl. 10. 1827.

Schimper, Synopsis, Ed. 2; 662, separates *Isothecium myosuroides* (L.) Brid. from the genus of which *I. myurum* (Pollich) Brid. remains the type. *I. myosuroides* clearly belongs to the Brachytheciaceae and all our American species are closely allied to it. Thus we have no American species of *Isothecium*.